



SEQUENCE LISTING

<10> Croce, Carlo
Brenner, Charles
Pekarski, Yuri

<120> CRYSTAL STRUCTURE OF WORM NitFhit
REVEALS THAT A Nit TETRAMER BINDS TWO Fhit DIMERS

<130> CRO01.NP007

<140> 09/855,294

<141> 2001-05-15

<150> 60/204,713

<151> 2000-05-16

<160> 11

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 276

<212> PRT

<213> Homo sapien

<400> 1

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			20					25					30		
Thr	Gln	Gly	Ala	Lys	Ile	Val	Ser	Leu	Pro	Glu	Cys	Phe	Asn	Ser	Pro
		35					40					45			
Tyr	Gly	Ala	Lys	Tyr	Phe	Pro	Glu	Tyr	Ala	Glu	Lys	Ile	Pro	Gly	Glu
	50					55				60					
Ser	Thr	Gln	Lys	Leu	Ser	Glu	Val	Ala	Lys	Glu	Cys	Ser	Ile	Tyr	Leu
65				70					75					80	
Ile	Gly	Gly	Ser	Ile	Pro	Glu	Glu	Asp	Ala	Gly	Lys	Leu	Tyr	Asn	Thr
			85					90						95	
Cys	Ala	Val	Phe	Gly	Pro	Asp	Gly	Thr	Leu	Leu	Ala	Lys	Tyr	Arg	Lys
			100					105					110		
Ile	His	Leu	Phe	Asp	Ile	Asp	Val	Pro	Gly	Lys	Ile	Thr	Phe	Gln	Glu
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Ser	Lys	Thr	Leu	Ser	Pro	Gly	Asp	Ser	Phe	Ser	Thr	Phe	Asp	Thr	Pro
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Tyr	Cys	Arg	Val	Gly	Leu	Gly	Ile	Cys	Tyr	Asp	Met	Arg	Phe	Ala	Glu
145					150				155					160	
Leu	Ala	Gln	Ile	Tyr	Ala	Gln	Arg	Gly	Cys	Gln	Leu	Leu	Val	Tyr	Pro
			165					170						175	
Gly	Ala	Phe	Asn	Leu	Thr	Thr	Gly	Pro	Ala	His	Trp	Glu	Leu	Leu	Gln
			180					185					190		

Arg	Ser	Arg	Ala	Val	Asp	Asn	Gln	Val	Tyr	Val	Ala	Thr	Ala	Ser	Pro
		195					200					205			
Ala	Arg	Asp	Asp	Lys	Ala	Ser	Tyr	Val	Ala	Trp	Gly	His	Ser	Thr	Val
	210					215					220				
Val	Asn	Pro	Trp	Gly	Glu	Val	Leu	Ala	Lys	Ala	Gly	Thr	Glu	Glu	Ala
225					230					235					240
Ile	Val	Tyr	Ser	Asp	Ile	Asp	Leu	Lys	Lys	Leu	Ala	Glu	Ile	Arg	Gln
				245					250					255	
Gln	Ile	Pro	Val	Phe	Arg	Gln	Lys	Arg	Ser	Asp	Leu	Tyr	Ala	Val	Glu
			260					265						270	
Met	Lys	Lys	Pro												
		275													

<210> 2
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 <212> PRT
 <213> mouse

<400> 2															
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Lys	Gln	Gly	Ala	Asn	Ile	Val	Ser	Leu	Pro	Glu	Cys	Phe	Asn	Ser	Pro
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Tyr	Gly	Thr	Thr	Tyr	Phe	Pro	Asp	Tyr	Ala	Glu	Lys	Ile	Pro	Gly	Glu
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Ser	Thr	Gln	Lys	Leu	Ser	Glu	Val	Ala	Lys	Glu	Ser	Ser	Ile	Tyr	Leu
65					70					75				80	
Ile	Gly	Gly	Ser	Ile	Pro	Glu	Glu	Asp	Ala	Gly	Lys	Leu	Tyr	Asn	Thr
				85					90					95	
Cys	Ser	Val	Phe	Gly	Pro	Asp	Gly	Ser	Leu	Leu	Val	Lys	His	Arg	Lys
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Ile	His	Leu	Phe	Asp	Ile	Asp	Val	Pro	Gly	Lys	Ile	Thr	Phe	Gln	Glu
		115					120					125			
Ser	Lys	Thr	Leu	Ser	Pro	Gly	Asp	Ser	Phe	Ser	Thr	Phe	Asp	Thr	Pro
	130					135					140				
Tyr	Cys	Lys	Val	Gly	Leu	Gly	Ile	Cys	Tyr	Asp	Met	Arg	Phe	Ala	Glu
145					150					155					160
Leu	Ala	Gln	Ile	Tyr	Ala	Gln	Arg	Gly	Cys	Gln	Leu	Leu	Val	Tyr	Pro
				165					170					175	
Gly	Ala	Phe	Asn	Leu	Thr	Thr	Gly	Pro	Ala	His	Trp	Glu	Leu	Leu	Gln
			180					185					190		
Arg	Ala	Arg	Ala	Val	Asp	Asn	Gln	Val	Tyr	Val	Ala	Thr	Ala	Ser	Pro
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Ala	Arg	Asp	Asp	Lys	Ala	Ser	Tyr	Val	Ala	Trp	Gly	His	Ser	Thr	Val
	210					215					220				
Val	Asp	Pro	Trp	Gly	Gln	Val	Leu	Thr	Lys	Ala	Gly	Thr	Glu	Glu	Thr
225					230					235					240
Ile	Leu	Tyr	Ser	Asp	Ile	Asp	Leu	Lys	Lys	Leu	Ala	Glu	Ile	Arg	Gln
				245					250					255	
Gln	Ile	Pro	Ile	Leu	Lys	Gln	Lys	Arg	Ala	Asp	Leu	Tyr	Thr	Val	Glu
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Ser	Lys	Lys	Pro												

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 <212> PRT
 <213> X. laevis

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 Glu Ala Ala Gly Arg Arg Ala Cys Met Val Phe Leu Pro Glu Ala Phe
 35 40 45
 Asp Tyr Ile Gly Gly Ser Ile Glu Glu Thr Leu Ser Leu Ala Glu Ser
 50 55 60
 Leu His Gly Asp Thr Ile Gln Arg Tyr Thr Gln Leu Ala Arg Glu Cys
 65 70 75 80
 Gly Leu Trp Leu Ser Leu Gly Gly Phe His Glu Lys Gly Pro Asn Trp
 85 90 95
 Asp Thr Asp Gln Arg Ile Ser Asn Ser His Val Val Val Asp Asn Thr
 100 105 110
 Gly His Ile Val Ser Val Tyr Arg Lys Ala His Leu Phe Asp Val Asp
 115 120 125
 Leu Gln Asn Gly Val Ser Leu Arg Glu Ser Ser Ser Thr Leu Pro Gly
 130 135 140
 Ala Glu Leu Ile Arg Pro Ile Thr Ser Pro Ala Gly Lys Ile Gly Leu
 145 150 155 160
 Gly Val Cys Tyr Asp Leu Arg Phe Pro Glu Phe Ser Leu Ala Leu Ala
 165 170 175
 Gln Gln Gly Ala Glu Leu Leu Thr Tyr Pro Ser Ala Phe Thr Leu Thr
 180 185 190
 Thr Gly Leu Ala His Trp Glu Val Leu Leu Arg Ala Arg Ala Ile Glu
 195 200 205
 Thr Gln Cys Tyr Val Val Ala Ala Gln Thr Asp Arg His Asn Glu
 210 215 220
 Lys Arg Thr Ser Tyr Gly His Ala Met Val Val Asp Pro Trp Gly Leu
 225 230 235 240
 Val Ile Gly Gln Cys Gln Glu Gly Thr Gly Ile Cys Tyr Ala Glu Ile
 245 250 255
 Asp Ile Pro Tyr Met Glu Arg Val Arg Arg Asp Met Pro Val Trp Arg
 260 265 270
 His Arg Arg Thr Asp Leu Tyr Gly Lys Ile Ser Phe Asn Lys Pro Asp
 275 280 285

<210> 4
 <211> 307
 <212> PRT
 <213> S. cerevisiae

<400> 4
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Ala Asp Leu Thr Lys Asn Leu Lys Val Val Lys Glu Leu Ile Ser Glu
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 Ala Ile Gln Lys Lys Ala Asp Val Val Phe Leu Pro Glu Ala Ser Asp
 35 40 45
 Tyr Leu Ser Gln Asn Pro Leu His Ser Arg Tyr Leu Ala Gln Lys Ser
 50 55 60
 Pro Lys Phe Ile Arg Gln Leu Gln Ser Ser Ile Thr Asp Leu Val Arg
 65 70 75 80
 Asp Asn Ser Arg Asn Ile Asp Val Ser Ile Gly Val His Leu Pro Pro
 85 90 95
 Ser Glu Gln Asp Leu Leu Glu Gly Asn Asp Arg Val Arg Asn Val Leu
 100 105 110
 Leu Tyr Ile Asp His Glu Gly Lys Ile Leu Gln Glu Tyr Gln Lys Leu
 115 120 125
 His Leu Phe Asp Val Asp Val Pro Asn Gly Pro Ile Leu Lys Glu Ser
 130 135 140
 Lys Ser Val Gln Pro Gly Lys Ala Ile Pro Asp Ile Ile Glu Ser Pro
 145 150 155 160
 Leu Gly Lys Leu Gly Ser Ala Ile Cys Tyr Asp Ile Arg Phe Pro Glu
 165 170 175
 Phe Ser Leu Lys Leu Arg Ser Met Gly Ala Glu Ile Leu Cys Phe Pro
 180 185 190
 Ser Ala Phe Thr Ile Lys Thr Gly Glu Ala His Trp Glu Leu Leu Gly
 195 200 205
 Arg Ala Arg Ala Val Asp Thr Gln Cys Tyr Val Leu Met Pro Gly Gln
 210 215 220
 Val Gly Met His Asp Leu Ser Asp Pro Glu Trp Glu Lys Gln Ser His
 225 230 235 240
 Met Ser Ala Leu Glu Lys Ser Ser Arg Arg Glu Ser Trp Gly His Ser
 245 250 255
 Met Val Ile Asp Pro Trp Gly Lys Ile Ala His Ala Asp Pro Ser
 260 265 270
 Thr Val Gly Pro Gln Leu Ile Leu Ala Asp Leu Asp Arg Glu Leu Leu
 275 280 285
 Gln Glu Ile Arg Asn Lys Met Pro Leu Trp Asn Gln Arg Arg Asp Asp
 290 295 300
 Leu Phe His
 305

<210> 5
 <211> 291
 <212> PRT
 <213> *S. cerevisiae*

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 20 25 30
 Ala Thr Phe Ile Glu Arg Ala Met Lys Glu Gln Pro Asp Thr Lys Leu
 35 40 45
 Val Val Leu Pro Glu Cys Phe Asn Ser Pro Tyr Ser Thr Asp Gln Phe
 50 55 60
 Arg Lys Tyr Ser Glu Val Ile Asn Pro Lys Glu Pro Ser Thr Ser Val

65	Gln	Phe	Leu	Ser	Asn	Leu	Ala	Asn	Lys	Phe	Lys	Ile	Ile	Leu	Val	Gly	80
				85						90						95	
	Gly	Thr	Ile	Pro	Glu	Leu	Asp	Pro	Lys	Thr	Asp	Lys	Ile	Tyr	Asn	Thr	
			100						105					110			
	Ser	Ile	Ile	Phe	Asn	Glu	Asp	Gly	Lys	Leu	Ile	Asp	Lys	His	Arg	Lys	
			115					120					125				
	Val	His	Leu	Phe	Asp	Val	Asp	Ile	Pro	Asn	Gly	Ile	Ser	Phe	His	Glu	
			130				135					140					
	Ser	Glu	Thr	Leu	Ser	Pro	Gly	Glu	Lys	Ser	Thr	Thr	Ile	Asp	Thr	Lys	
	145					150					155					160	
	Tyr	Gly	Lys	Phe	Gly	Val	Gly	Ile	Cys	Tyr	Asp	Met	Arg	Phe	Pro	Glu	
				165						170					175		
	Leu	Ala	Met	Leu	Ser	Ala	Arg	Lys	Gly	Ala	Phe	Ala	Met	Ile	Tyr	Pro	
				180					185					190			
	Ser	Ala	Phe	Asn	Thr	Val	Thr	Gly	Pro	Leu	His	Trp	His	Leu	Leu	Ala	
			195					200					205				
	Arg	Ser	Arg	Ala	Val	Asp	Asn	Gln	Val	Tyr	Val	Met	Leu	Cys	Ser	Pro	
	210						215					220					
	Ala	Arg	Asn	Leu	Gln	Ser	Ser	Tyr	His	Ala	Tyr	Gly	His	Ser	Ile	Val	
	225					230					235				240		
	Val	Asp	Pro	Arg	Gly	Lys	Ile	Val	Ala	Glu	Ala	Gly	Glu	Gly	Glu	Glu	
				245						250					255		
	Ile	Ile	Tyr	Ala	Glu	Leu	Asp	Pro	Glu	Val	Ile	Glu	Ser	Phe	Arg	Gln	
				260					265					270			
	Ala	Val	Pro	Leu	Thr	Lys	Gln	Arg	Arg	Phe	Asp	Val	Tyr	Ser	Asp	Val	
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	Asn	Ala	His														
			290														

<210> 6
 <211> 276
 <212> PRT
 <213> S. pombe

<400> 6	Met	Thr	Leu	Ala	Ala	Val	Ala	Gln	Leu	Asn	Ser	Ser	Gly	Ser	Ile	Leu
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			20						25					30		
	Gly	Ala	Lys	Cys	Ile	Phe	Phe	Pro	Glu	Ala	Ser	Asp	Phe	Ile	Ala	His
			35					40					45			
	Asn	Ser	Asp	Glu	Ala	Ile	Glu	Leu	Thr	Asn	His	Pro	Asp	Cys	Ser	Lys
			50				55					60				
	Phe	Ile	Arg	Asp	Val	Arg	Glu	Ser	Ala	Thr	Lys	His	Ser	Ile	Phe	Val
	65					70					75				80	
	Asn	Ile	Cys	Val	His	Glu	Pro	Ser	Lys	Val	Lys	Asn	Lys	Leu	Leu	Asn
				85						90					95	
	Ser	Ser	Leu	Phe	Ile	Glu	Pro	Leu	His	Gly	Glu	Ile	Ile	Ser	Arg	Tyr
				100					105					110		
	Ser	Lys	Ala	His	Leu	Phe	Asp	Val	Glu	Ile	Lys	Asn	Gly	Pro	Thr	Leu
			115					120					125			
	Lys	Glu	Ser	Asn	Thr	Thr	Leu	Arg	Gly	Glu	Ala	Ile	Leu	Pro	Pro	Cys
			130				135						140			

Lys	Thr	Pro	Leu	Gly	Lys	Val	Gly	Ser	Ala	Ile	Cys	Phe	Asp	Ile	Arg
145					150					155					160
Phe	Pro	Glu	Gln	Ala	Ile	Lys	Leu	Arg	Asn	Met	Gly	Ala	His	Ile	Ile
				165					170					175	
Thr	Tyr	Pro	Ser	Ala	Phe	Thr	Glu	Lys	Thr	Gly	Ala	Ala	His	Trp	Glu
			180					185					190		
Val	Leu	Leu	Arg	Ala	Arg	Ala	Leu	Asp	Ser	Gln	Cys	Tyr	Val	Ile	Ala
		195					200					205			
Pro	Ala	Gln	Gly	Gly	Lys	His	Asn	Glu	Lys	Arg	Ala	Ser	Tyr	Gly	His
	210					215					220				
Ser	Met	Ile	Val	Asp	Pro	Trp	Gly	Thr	Val	Ile	Ala	Gln	Tyr	Ser	Asp
225					230					235					240
Ile	Ser	Ser	Pro	Asn	Gly	Leu	Ile	Phe	Ala	Asp	Leu	Asp	Leu	Asn	Leu
				245					250					255	
Val	Asp	His	Val	Arg	Thr	Tyr	Ile	Pro	Leu	Leu	Arg	Arg	Asn	Asp	Leu
			260					265					270		
Tyr	Pro	Thr	Ile												
			275												

<210> 7
 <211> 322
 <212> PRT
 <213> S. pombe

<400> 7

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			20					25					30		
Ala	Ser	Ser	Leu	Val	Pro	Lys	Asp	Phe	Arg	Ala	Phe	Arg	Ile	Gly	Leu
			35				40					45			
Val	Gln	Leu	Ala	Asn	Thr	Lys	Asp	Lys	Ser	Glu	Asn	Leu	Gln	Leu	Ala
	50					55				60					
Arg	Leu	Lys	Val	Leu	Glu	Ala	Ala	Lys	Asn	Gly	Ser	Asn	Val	Ile	Val
65					70					75				80	
Leu	Pro	Glu	Ile	Phe	Asn	Ser	Pro	Tyr	Gly	Thr	Gly	Tyr	Phe	Asn	Gln
				85					90				95		
Tyr	Ala	Glu	Pro	Ile	Glu	Glu	Ser	Ser	Pro	Ser	Tyr	Gln	Ala	Leu	Ser
			100					105					110		
Ser	Met	Ala	Lys	Asp	Thr	Lys	Thr	Tyr	Leu	Phe	Gly	Gly	Ser	Ile	Pro
		115						120				125			
Glu	Arg	Lys	Asp	Gly	Lys	Leu	Tyr	Asn	Thr	Ala	Met	Val	Phe	Asp	Pro
	130					135					140				
Ser	Gly	Lys	Leu	Ile	Ala	Val	His	Arg	Lys	Ile	His	Leu	Phe	Asp	Ile
145					150					155					160
Asp	Ile	Pro	Gly	Gly	Val	Ser	Phe	Arg	Glu	Ser	Asp	Ser	Leu	Ser	Pro
				165					170					175	
Gly	Asp	Ala	Met	Thr	Met	Val	Asp	Thr	Glu	Tyr	Gly	Lys	Phe	Gly	Leu
			180					185					190		
Gly	Ile	Cys	Tyr	Asp	Ile	Arg	Phe	Pro	Glu	Leu	Ala	Met	Ile	Ala	Ala
		195					200					205			
Arg	Asn	Gly	Cys	Ser	Val	Met	Ile	Tyr	Pro	Gly	Ala	Phe	Asn	Leu	Ser
	210					215					220				
Thr	Gly	Pro	Leu	His	Trp	Glu	Leu	Leu	Ala	Arg	Ala	Arg	Ala	Val	Asp

225	230	235	240
Asn Glu Met Phe Val	Ala Cys Cys Ala Pro	Ala Arg Asp Met Asn	Ala
245	250	255	
Asp Tyr His Ser Trp	Gly His Ser Thr Val	Val Asp Pro Phe Gly	Lys
260	265	270	
Val Ile Ala Thr Thr	Asp Glu Lys Pro Ser	Ile Val Tyr Ala Asp	Ile
275	280	285	
Asp Pro Ser Val Met	Ser Thr Ala Arg Asn	Ser Val Pro Ile Tyr	Thr
290	295	300	
Gln Arg Arg Phe Asp	Val Tyr Ser Glu Val	Leu Pro Ala Leu Lys	Lys
305	310	315	320
Glu Glu			

<210> 8
 <211> 1359
 <212> DNA
 <213> Homo sapien

<400> 8

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caaggagcca	aaatagtttc	tttgccggaa	tgctttaatt	ctccatatgg	agcgaaatat	180
tttctgaat	atgcagagaa	aattcctggg	gaatccacac	agaagctttc	tgaagtagca	240
aaggaatgca	gcataatatc	cattggaggc	tctatccctg	aagaggatgc	tgggaaatta	300
tataacacct	gtgctgtgtt	tgggcctgat	ggaactttac	tagcaaagta	tagaaagatc	360
catctgtttg	acattgatgt	tcctggaaaa	attacatttc	aagaatctaa	aacattgagt	420
ccgggtgata	gtttctccac	atttgatact	ccttactgca	gagtggttct	gggcatctgc	480
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atacgccagc	aaatccccgt	ttttagacag	aagcgatcag	acctctatgc	tgtggagatg	840
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aacctaggtt	ctctattgag	atgagaaagc	ctcattatgc	tgacattttc	cacgccacat	1020
taaatagtta	aaaaggatgc	agcctggagc	cagagagcag	aaagctgggc	tggttctgaa	1080
gcttcttcca	tacttaagtt	gcctccaagc	agtttgtgaa	agtatcagat	cttggtatcc	1140
tgggtgattga	ttcacctaata	ataaatatat	ttgtgtcatg	aacctcttaa	aaagttgctg	1200
ggagttgtaa	tctccatcat	ctaggaaaac	gtgggtctgg	gtgctattct	tttccaagca	1260
ggtaccttgn	aagttccatt	tttgggttca	tgagtagcta	taggaacgca	agggtgatac	1320
atctttgggt	gttttgccag	agaagttggg	cagccccac			1359

<210> 9
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 <212> DNA
 <213> mouse

<400> 9

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agcctagtgc	gggaggcagc	aaagcaagg	gccaacatag	tttctctgcc	tgagtgttc	180
aattctccat	atggaacaac	ctactttcct	gactatgcag	agaagattcc	tggagagtcc	240

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<211> 1214
<212> DNA
<213> X. laevis
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<210> 11
<211> 346
<212> PRT
<213> A. thaliana
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- 8 -

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Ser	Thr	Val	Tyr	Asn	Asp	Thr	Pro	Ala	Thr	Ile	Asp	Lys	Ala	Glu	Lys
		35					40					45			
Tyr	Ile	Val	Glu	Ala	Ala	Ser	Lys	Gly	Ala	Glu	Leu	Val	Leu	Phe	Pro
		50				55					60				
Glu	Gly	Phe	Ile	Gly	Gly	Tyr	Pro	Arg	Gly	Phe	Arg	Phe	Gly	Leu	Ala
65					70					75					80
Val	Gly	Val	His	Asn	Glu	Glu	Gly	Arg	Asp	Glu	Phe	Arg	Lys	Tyr	His
			85						90					95	
Ala	Ser	Ala	Ile	His	Val	Pro	Gly	Pro	Glu	Val	Ala	Arg	Leu	Ala	Asp
			100					105					110		
Val	Ala	Arg	Lys	Asn	His	Val	Tyr	Leu	Val	Met	Gly	Ala	Ile	Glu	Lys
		115					120					125			
Glu	Gly	Tyr	Thr	Leu	Tyr	Cys	Thr	Val	Leu	Phe	Phe	Ser	Pro	Gln	Gly
		130				135						140			
Gln	Phe	Leu	Gly	Lys	His	Arg	Lys	Leu	Met	Pro	Thr	Ser	Leu	Glu	Arg
145					150					155					160
Cys	Ile	Trp	Gly	Gln	Gly	Asp	Gly	Ser	Thr	Ile	Pro	Val	Tyr	Asp	Thr
				165					170					175	
Pro	Ile	Gly	Lys	Leu	Gly	Ala	Ala	Ile	Cys	Trp	Glu	Asn	Arg	Met	Pro
			180					185					190		
Leu	Tyr	Arg	Thr	Ala	Leu	Tyr	Ala	Lys	Gly	Ile	Glu	Leu	Tyr	Cys	Ala
		195					200					205			
Pro	Thr	Ala	Asp	Gly	Ser	Lys	Glu	Trp	Gln	Ser	Ser	Met	Leu	His	Ile
		210				215					220				
Ala	Ile	Glu	Gly	Gly	Cys	Phe	Val	Leu	Ser	Ala	Cys	Gln	Phe	Cys	Gln
225					230					235					240
Arg	Lys	His	Phe	Pro	Asp	His	Pro	Asp	Tyr	Leu	Phe	Thr	Asp	Trp	Tyr
				245					250					255	
Asp	Asp	Lys	Glu	His	Asp	Ser	Ile	Val	Ser	Gln	Gly	Gly	Ser	Val	Ile
			260					265					270		
Ile	Ser	Pro	Leu	Gly	Gln	Val	Leu	Ala	Gly	Pro	Asn	Phe	Glu	Ser	Glu
		275					280					285			
Gly	Leu	Val	Thr	Ala	Asp	Ile	Asp	Leu	Gly	Asp	Ile	Ala	Arg	Ala	Lys
		290				295					300				
Leu	Tyr	Phe	Asp	Ser	Val	Gly	His	Tyr	Ser	Arg	Pro	Asp	Val	Leu	His
305					310					315					320
Leu	Thr	Val	Asn	Glu	His	Pro	Arg	Lys	Ser	Val	Thr	Phe	Val	Thr	Lys
				325					330					335	
Val	Glu	Lys	Ala	Glu	Asp	Asp	Ser	Asn	Lys						
			340					345							